SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies the furnishing, installation and connection of the interior lighting systems.

1.2 RELATED WORK

A. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirement for seismic restraint for nonstructural Components.

B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General requirements that are common to more than one section of Division 26.

C. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Cables and wiring.

D. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path to ground for possible ground fault currents.

E. Section 26 27 26, WIRING DEVICES: Wiring devices used for control of the lighting systems.

1.3 QUALITY ASSURANCE

Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

A. In accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, submit the following:

B. Product Data: For each type of lighting fixture (luminaire) designated on the LIGHTING FIXTURE SCHEDULE, arranged in order of fixture designation, submit the following information.

1. Material and construction details include information on housing, optics system and lens/diffuser.
2. Physical dimensions and description.
3. Wiring schematic and connection diagram.
4. Installation details.
5. Energy efficiency data.
6. Photometric data based on laboratory tests complying with IESNA Lighting Measurements, testing and calculation guides.
7. Lamp data including lumen output (initial and mean), color rendition index (CRI), rated life (hours) and color temperature (degrees Kelvin).

8. Ballast data including ballast type, starting method, ambient temperature, ballast factor, sound rating, system watts and total harmonic distortion (THD).

C. Manuals:

1. Submit, simultaneously with the shop drawings companion copies of complete maintenance and operating manuals including technical data sheets, and information for ordering replacement parts.
2. Two weeks prior to the final inspection, submit four copies of the final updated maintenance and operating manuals, including any changes, to the Resident Engineer.

D. Certifications:

1. Two weeks prior to final inspection, submit four copies of the following certifications to the Resident Engineer:
   a. Certification by the Contractor that the equipment has been properly installed, adjusted, and tested.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. Institute of Electrical and Electronic Engineers (IEEE):

C62.41-91.....Guide on the Surge Environment in Low Voltage (1000V and less) AC Power Circuits

C. National Fire Protection Association (NFPA):

70.....National Electrical Code (NEC)
101.....Life Safety Code

D. National Electrical Manufacturer's Association (NEMA):

C82.1-97.....Ballasts for Fluorescent Lamps - Specifications
C82.2-02.....Method of Measurement of Fluorescent Lamp Ballasts
C82.4-02.....Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps
C82.11-02.....High Frequency Fluorescent Lamp Ballasts

E. Underwriters Laboratories, Inc. (UL):

496-96.....Edison-Base Lampholders
542-99.....Lampholders, Starters, and Starter Holders for Fluorescent Lamps
844-95.....Electric Lighting Fixtures for Use in Hazardous (Classified) Locations
924-95.....Emergency Lighting and Power Equipment
935-01.....Fluorescent-Lamp Ballasts
1029-94.....High-Intensity-Discharge Lamp Ballasts

1029A-06.....Ignitors and Related Auxiliaries for HID Lamp Ballasts
1598-00.....Luminaires
1574-04.....Standard for Track Lighting Systems
2108-04.....Standard for Low-Voltage Lighting Systems
8750-08.....Light Emitting Diode (LED) Light Sources for Use in Lighting Products

F. Federal Communications Commission (FCC):
Code of Federal Regulations (CFR), Title 47, Part 18

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES (LUMINAIRES)

A. Shall be in accordance with NFPA 70 and UL 1598, as shown on drawings, and as specified. Refer to Architectural plans and elevations for compatibility with the aesthetics of the design intent.
B. Sheet Metal:
1. Shall be formed to prevent warping and sagging. Housing, trim and lens frame shall be true, straight (unless intentionally curved) and parallel to each other as designed.
2. Wireways and fittings shall be free of burrs and sharp edges and shall accommodate internal and branch circuit wiring without damage to the wiring.
3. When installed, any exposed fixture housing surface, trim frame, door frame and lens frame shall be free of light leaks; lens doors shall close in a light tight manner.
4. Hinged door closure frames shall operate smoothly without binding when the fixture is in the installed position, latches shall function easily by finger action without the use of tools.
C. Ballasts shall be serviceable while the fixture is in its normally installed position, and shall not be mounted to removable reflectors or wireway covers unless so specified.
D. Lamp Sockets:
1. Fluorescent: Lampholder contacts shall be the biting edge type or phosphorous-bronze with silver flash contact surface type and shall conform to the applicable requirements of UL 542. Lamp holders for bi-pin lamps shall be of the telescoping compression type, or of the single slot entry type requiring a one-quarter turn of the lamp after insertion.
2. High Intensity Discharge (H.I.D.): Shall have porcelain enclosures.
E. Recessed fixtures mounted in an insulated ceiling shall be listed for use in insulated ceilings.

F. Mechanical Safety: Lighting fixture closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, captive hinges or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.

G. Metal Finishes:

1. The manufacturer shall apply standard finish (unless otherwise specified) over a corrosion resistant primer, after cleaning to free the metal surfaces of rust, grease, dirt and other deposits. Edges of pre-finished sheet metal exposed during forming, stamping or shearing processes shall be finished in a similar corrosion resistant manner to match the adjacent surface(s). Fixture finish shall be free of stains or evidence of rusting, blistering, or flaking, and shall be applied after fabrication.
2. Interior light reflecting finishes shall be white with not less than 85 percent reflectances, except where otherwise shown on the drawing.
3. Exterior finishes shall be as shown on the drawings.

H. Lighting fixtures shall have a specific means for grounding metallic wireways and housings to an equipment grounding conductor.

I. Light Transmitting Components for Fluorescent Fixtures:

1. Shall be 100 percent virgin acrylic.
2. Flat lens panels shall have not less than 1/8 inch [3.2mm] of average thickness. The average thickness shall be determined by adding the maximum thickness to the minimum unpenetrated thickness and dividing the sum by 2.
3. Unless otherwise specified, lenses, diffusers and louvers shall be retained firmly in a metal frame by clips or clamping ring in such a manner as to allow expansion and contraction of the lens without distortion or cracking.

J. Lighting fixtures in hazardous areas shall be suitable for installation in Class and Group areas as defined in NFPA 70, and shall comply with UL 844.

K. Compact fluorescent fixtures shall be manufactured specifically for compact fluorescent lamps with ballast integral to the fixture. Assemblies designed to retrofit incandescent fixtures are prohibited except when specifically indicated for renovation of existing fixtures (not the lamp). Fixtures shall be designed for lamps as specified.

1 L. Fixture Types. Refer to schedule in drawings and below.

1. Type A1

a. Housing: Die formed cold rolled steel and rigid end plates. Ballast shall be accessible from below fixture. Recessed in Acoustical Tile Grid.

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b. Finish: White enamel
c. Optics: Volumetric with two lamping compartments. Reflector shall be highly reflective baked matte white enamel. acrylic lens shall be positively retained.
d. Dimensions: 2′ W x 4′ L x 3-1/4″ D
e. Ballast: NEMA Premium, Electronic program rapid start.
f. Lamps: 2-F32W T8, 3500K

2. Type A2
   a. Housing: Similar to Type A1 except provide with drywall frame kit.
   b. Finish: Similar to Type A1
   c. Optics: Similar to Type A1
   d. Dimensions: Similar to Type A1
   e. Ballast: Similar to Type A1
   f. Lamps: Similar to Type A1
3. Type A3
   a. Housing: Similar to type A1
   b. Finish: Similar to type A1
   c. Optics: Similar to type A1
   d. Dimensions: Similar to type A1
   e. Ballast: Dimmable; Coordinate ballast with applicable dimming control/module.
   f. Lamps: Similar to Type A1
4. Type B1
   a. Housing: Similar to Type A1
   b. Finish: Similar to Type A1
   c. Optics: Similar to Type A1
   d. Dimensions: 2′ W x 2′ L x 3-1/4″ D
   e. Ballast: Similar to Type A1
   f. Lamp: 2 – F17W T8; 3500k
5. Type B2
   a. Housing: Similar to Type A1
   b. Finish: Similar to Type A1
   c. Optics: Similar to Type A1
   d. Dimensions: Similar to type B1
   e. Ballast: Similar to Type B1
   f. Lamp: Similar to Type B1
6. Type C1
   a. Housing: Steel Channel with factory wireguard.
   b. Finish: Highgloss, backed polyester.
   c. Dimensions: 4′ L x 4-3/8″ W x 3-3/8″ D

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d. Ballast: NEMA Premium, Electronic Program Rapid Start
e. Lamp: 2 – 32w T8, 3500k

7. Type C2
   a. Housing: Low profile housing. Extruded aluminum with integral optical assembly.
   b. Finish: Anodized aluminum.
   c. Dimension: 3/4" W x 3/4" D; length as required.
   d. Lamps: Integral LED, minimum 3000K, maximum 4100K.
8. Type C3
   a. Housing: Extruded aluminum with integral optical assembly.
   b. Finish: Anodized aluminum.
   c. C. Optics: Frosted lens.
   d. Dimensions: 2" W x 3" D; length as required.
   e. Lamps: Integral LED, minimum 3000K, maximum 4100K.
9. Type D
   a. Housing: Low profile housing. Flat-bottom acrylic prismatic diffuser with sonic-welded, injection molded, luminous ends. Diffuser shall be secured with torsion screws and hinges/latches shall allow for service/cleaning from either side.
   b. Finish: Baked, white enamel
   c. Dimensions: 4' L x 11-1/4" W x 3-3/8" D
   d. Ballast: NEMA Premium, Electronic Program Rapid Start
   e. Lamp: 2-32w T8, 3500k
10. Type E
   a. Housing: Cold-rolled steel. Louvers shall be premium grade anodized aluminum. Integral T-Bar Safety clips.
   b. Finish: High-Gloss, baked white enamel housing. Low-iridescent anodized diffused silver louvers.
   c. Dimensions: 4' L x 1' W x 7-1/4" D
   d. Ballast: NEMA Premium, Electronic Program Rapid Start
   e. Lamp: 2-32w T8/3500k
11. Type F
   a. Housing: Heavy-gauge die-formed galvanized steel frame. Vertically adjustable mounting brackets.
   b. Optic: Open, clear diffuse.
   c. Lamps: 1 – 26w TRT
12. Type F1
   a. Housing: Similar to Type F
   b. Optics: Similar to Type F
   c. Lamps: Similar to Type F

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d. Ballast: Dimmable, Coordinate ballast with applicable control/module.

13. Type G1
    a. Housing: One-piece 20 gauge steel. Trim shall be constructed of 6063-T5 excluded aluminum.
    b. Finish: Matte Satin White Polyester Powder Coat
    c. Optics: 22 gauge steel reflector finished in high reflectance white powder coat. Frosted acrylic lens diffuser, 0.118″ thick.
    d. Dimensions: 4′ L x 4″ W x 5″ D
    e. Ballast: NEMA Premium, Electronic Program Rapid Start
    f. Lamp: 1-28w T5, 3500k
14. Type G2
    a. Housing: Similar to Type G1
    b. Finish: Similar to Type G1
    c. Optics: Similar to Type G1
    d. Dimensions: 8′ L x 4″ W x 5″ D
    e. Ballasts: Similar to Type G1
    f. Lamp: Similar to Type G1
15. Type G3
    a. Housing: Similar to Type G1
    b. Finish: Similar to Type G1
    c. Optics: Similar to Type G1
    d. Dimensions: 8′ L x 4″ W x 5″ D
    e. Ballast: Dimmable; coordinate ballast with applicable dimming control/module.
    f. Lamps: Similar to Type G1
16. Type H
    a. Housing: Die-Formed, heavy duty code grade steel.
    b. Finish: High-gloss, high reflectivity, baked white polyester.
    c. Optics: A12 pattern clear acrylic lens.
    d. Dimensions: 4′ L x 4-5/8″ W x 4-9/16″ D
    e. Ballast: NEMA Premium, Electronic Program Rapid Start
    f. Lamps: 2-32W T8, 3500K
17. Type J
    a. Shall match existing 4′x4′ Architectural Recessed fluorescent fixtures in adjacent Hospital corridors. Field verify.
18. Type K1

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a. Housing: Extruded Aluminum housing with two (2) 3/8″ stems and swivel connected to extended aluminum lamp enclosure.
b. Finish: Metallic Aluminum Powder coated.
c. Optics: 3/8″ thick curved glass diffuser with etched top and bottom. Clear polished edges.
d. Dimensions: Housing; 22-3/8″ L x 4″ W x 2″ D
Pendant Length; 20 ¾″
Lamp Enclosure; 42-7/8″ L x 8-1/4″ W x 6-7/8″ D
e. Ballast: NEMA Premium, Electronic Program Rapid Start.
f. Lamps: 2-F28W T5, 3500K.

19. Type K2
a. Die-cast Aluminum base that supports glass cylinder.
b. Finish: Powder coated matte silver.
c. Optics: Etched glass cylindrical diffuser.
d. Dimensions: Overall; 10-5/8″ L x 5-7/8″ W.
Glass: 7-7/8″ L x 5-1/8″ W.
e. Ballast: Electronic, high efficiency.
f. Lamps: 1-39W CMH

2.2 BALLASTS

A. Linear Fluorescent Lamp Ballasts: Multi-voltage (120 – 277V) electronic programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Provide dual ballasts for fixtures indicated for dual switching. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated; including the following features:
1. Lamp end-of-life detection and shutdown circuit (T5 lamps only).
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: Class A.
4. Total Harmonic Distortion Rating: 10 percent or less.
5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. Ballast Factor: 0.87 or higher unless otherwise indicated.
9. Power Factor: 0.98 or higher.
10. Interference: Comply with 47 CFT 18, Ch.1, Subpart C, for limitations on electromagnetic and radio-frequency interference for non-consumer equipment.
11. To facilitate multi-level lamp switching, lamps within fixture shall be wired with the outermost lamp at both sides of the fixture on the same ballast, the next inward pair on another ballast and so on to

the innermost lamp (or pair of lamps). Within a given room, each switch shall uniformly control the same corresponding lamp (or lamp pairs) in all fixture units that are being controlled.

12. Where three-lamp fixtures are indicated, unless switching arrangements dictate otherwise, utilize a common two-lamp ballast to operate the center lamp in pairs of adjacent units that are mounted in a continuous row. The ballast fixture and slave-lamp fixture shall be factory wired with leads or plug devices to facilitate this circuiting. Individually mounted fixtures and the odd fixture in a row shall utilize a single-lamp ballast for operation of the center lamp.
13. Dimming ballasts shall be as per above, except dimmable from 100% to 5% of rated lamp lumens.

B. Compact Fluorescent Lamp Ballasts: Multi-voltage (120 – 277V), electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated; including the following features:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.
   3. Sound Rating: Class A.
   4. Total Harmonic Distortion Rating: 10 percent or less.
   5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   6. Operating Frequency: 20 kHz or higher.
   7. Lamp Current Crest Factor: 1.7 or less.
   8. Ballast Factor: 0.95 or higher unless otherwise indicated.
   9. Power Factor: 0.98 or higher.
   10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for non-consumer equipment.
   11. Dimming ballasts shall be as per above, except dimmable from 100% to 5% of rated lamp lumens.

C. Ballasts for high intensity discharge fixtures: Multi-tap voltage (120-480v) electromagnetic ballast for high intensity discharge lamps. Comply with ANSI C82.4 and UL 1029. Include the following features unless otherwise indicated:
   1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
   2. Minimum Starting Temperature: Minus 22 deg F (Minus 30 deg C) for single-lamp ballasts.

3. Rated Ambient Operating Temperature: 104 deg F (40 deg C).
4. Open-circuit operation that will not reduce average life.
5. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.

D. Electronic ballast for high intensity discharge metal-halide lamps shall include the following features unless otherwise indicated:
1. Minimum Starting Temperature: Minus 20 deg F (Minus 29 deg C) for single-lamp ballasts.
2. Rated Ambient Operating Temperature: 130 deg F (54 deg C).
3. Lamp end-of-life detection and shutdown circuit.
4. Sound Rating: Class A.
5. Total Harmonic Distortion Rating: 20 percent or less.
6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
7. Lamp Current Crest Factor: 1.5 or less.
8. Power Factor: 0.90 or higher.
9. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for non-consumer equipment.
10. Protection: Class P thermal cut.

2.3 LAMPS

A. Linear and U-shaped T5 and T8 Fluorescent Lamps:
1. Rapid start fluorescent lamps shall comply with ANSI C78.1; and instant-start lamps shall comply with ANSI C78.3.
2. Chromacity of fluorescent lamps shall comply with ANSI C78.376.
3. Except as indicated below, lamps shall be low-mercury energy saving type, have a color temperature between 3500° and 4100°K, a Color Rendering Index (CRI) of greater than 70, average rated life of 20,000 hours, and be suitable for use with dimming ballasts, unless otherwise indicated. Low mercury lamps shall have passed the EPA Toxicity Characteristic Leachate Procedure (TCLP) for mercury by using the lamp sample preparation procedure described in NEMA LL

B. Compact Fluorescent Lamps:
1. T4, CRI 80 (minimum), color temperature 3500 K, and suitable for use with dimming ballasts, unless otherwise indicated.

C. Long Twin-Tube Fluorescent Lamps:
1. T5, CRI 80 (minimum), color temperature between 3500° and 4100°K, 20,000 hours average rated life.

D. High Intensity Discharge Lamps:

1. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000°K.
2. Ceramic, Pulse-Start, Metal-Halide Lamps: CRI 80 (minimum), and color temperature 4000°K.

2.4 EXIT LIGHT FIXTURES

A. Exit light fixtures shall meet applicable requirements of NFPA 101 and UL 924 and shall match existing hospital exit light fixtures.

B. Housing and Canopy:
1. Shall be made of die-cast aluminum.
2. Optional steel housing shall be a minimum 20 gauge thick or equivalent strength aluminum.
3. Steel housing shall have baked enamel over corrosion resistant, matte black or ivory white primer.

C. Door frame shall be cast or extruded aluminum, and hinged with latch.

D. Finish shall be satin or fine-grain brushed aluminum.

E. There shall be no radioactive material used in the fixtures.

F. Fixtures:
1. Maximum fixture wattage shall be 1 watt or less.
2. Inscription panels shall be edge-lit acrylic panels. Green letters on clear panel. Lamps shall be luminous Light Emitting Diodes (LED) and provide uniform illumination of panel. The LED shall be rated minimum 25 years life.
3. Double-Faced Fixtures: Provide double-faced fixtures where required or as shown on drawings.
4. Directional Arrows: Provide directional arrows as part of the inscription panel where required or as shown on drawings. Directional arrows shall be the "chevron-type" of similar size and width as the letters and meet the requirements of NFPA 101.

G. Voltages: Refer to Lighting Fixture Schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the NEC, manufacturer's instructions and as shown on the drawings or specified.

B. Align, mount and level the lighting fixtures uniformly.

C. Lighting Fixture Supports:
1. Shall provide support for all of the fixtures. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
2. Shall maintain the fixture positions after cleaning and relamping.

3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.
4. Hardware for recessed lighting fixtures:
   a. All fixture mounting devices connecting fixtures to the ceiling system or building structure shall have a capacity for a horizontal force of 100 percent of the fixture weight and a vertical force of 400 percent of the fixture weight.
   b. Mounting devices shall clamp the fixture to the ceiling system structure (main grid runners or fixture framing cross runners) at four points in such a manner as to resist spreading of these supporting members. Each support point device shall utilize a screw or approved hardware to "lock" the fixture housing to the ceiling system, restraining the fixture from movement in any direction relative to the ceiling. The screw (size No. 10 minimum) or approved hardware shall pass through the ceiling member (T-bar, channel or spline), or it may extend over the inside of the flange of the channel (or spline) that faces away from the fixture, in a manner that prevents any fixture movement.
   c. In addition to the above, the following is required for fixtures exceeding 20 pounds [9kg] in weight.
      1) Where fixtures mounted in ASTM Standard C635-69 "Intermediate" and "Heavy Duty" ceilings and weigh between 20 pounds and 56 pounds [9kg and 25kg] provide two 12 gauge safety hangers hung slack between diagonal corners of the fixture and the building structure.
      2) Where fixtures weigh over 56 pounds [25kg] they shall be independently supported from the building structure by approved hangers. Two-way angular bracing of hangers shall be provided to prevent lateral motion.
   d. Where ceiling cross runners are installed for support of lighting fixtures, they must have a carrying capacity equal to that of the main ceiling runners and be rigidly secured to the main runners.
5. Surface mounted lighting fixtures:
   a. Fixtures shall be bolted against the ceiling independent of the outlet box at four points spaced near the corners of each unit. The bolts (or stud-clips) shall be minimum 1/4-20 [6mm] bolt, secured to main ceiling runners and/or secured to cross runners. Non-turning studs may be attached to the main ceiling runners and cross runners with special non-friction clip devices designed for the purpose, provided they bolt through the runner, or are also secured to the building structure by 12 gauge safety hangers.

Studs or bolts securing fixtures weighing in excess of 56 pounds [25kg] shall be supported directly from the building structure.

b. Where ceiling cross runners are installed for support of lighting fixtures they must have a carrying capacity equal to that of the main ceiling runners and be rigidly secured to the main runners.

c. Fixtures less than 15 pounds [6.8kg] in weight and occupying less than two square feet [600mm x 600mm] of ceiling area may, (when designed for the purpose) be supported directly from the outlet box when all the following conditions are met.

1) Screws attaching the fixture to the outlet box pass through round holes (not key-hole slots) in the fixture body.

2) The outlet box is attached to a main ceiling runner (or cross runner) with approved hardware.

3) The outlet box is supported vertically from the building structure.

d. Fixtures mounted in open construction shall be secured directly to the building structure with approved bolting and clamping devices.

6. Single or double pendant-mounted lighting fixtures:

a. Each stem shall be supported by an approved outlet box, mounted swivel joint and canopy which holds the stem captive and provides spring load (or approved equivalent) dampening of fixture oscillations. Outlet box shall be supported vertically from the building structure.

7. Outlet boxes for support of lighting fixtures (where permitted) shall be secured directly to the building structure with approved devices or supported vertically in a hung ceiling from the building structure with a nine gauge wire hanger, and be secured by an approved device to a main ceiling runner or cross runner to prevent any horizontal movement relative to the ceiling.

D. Furnish and install the specified lamps for all lighting fixtures installed and all existing lighting fixtures reinstalled under this project.

E. Coordinate between the electrical and ceiling trades to ascertain that approved lighting fixtures are furnished in the proper sizes and installed with the proper devices (hangers, clips, trim frames, flanges), to match the ceiling system being installed.

F. Bond lighting fixtures and metal accessories to the grounding system as specified in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

G. Exercise electronic dimming ballasts over full range of dimming capability by operating the control devices(s) in the presence of the

Resident Engineer. Observe for visually detectable flicker over full dimming range.

H. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Government. Burn-in period to be 40 hours minimum, unless a lesser period is specifically recommended by lamp manufacturer. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage. Replace any lamps and ballasts which fail during burn-in.

I. At completion of project, relamp/reballast fixtures which have failed lamps/ballasts. Clean fixtures, lenses, diffusers and louvers that have accumulated dust/dirt/fingerprints during construction. Replace damaged lenses, diffusers and louvers with new.

J. Dispose of lamps per requirements of Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

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